

White Paper



# Maximizing Application Performance

Building a Secure Application Infrastructure that Optimizes Application Performance and Reduces the Cost of Operations

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### The Challenges of Application Delivery It Isn't Easy

Today's enterprises rely heavily on their business applications. Inventory, customer relations, sales, accounting, and other applications are the life blood of a company's operations, and delivering these applications to users is a major challenge for businesses today. In order to be most productive, employees, telecommuters, business partners, customers, and remote office workers must all have unimpeded access to their critical applications. Any shortcomings in usability, security, or availability will cause productivity and profitability to suffer.

There are many obstacles to delivering applications efficiently. Low-bandwidth, high-latency WAN and dial-up connections result in low throughput and long wait times. Incomplete security leaves holes through which private data can be intercepted or applications can be brought down. Server resource constraints produce poor response times for all users. A large user base strains infrastructure and causes outages. Slow or difficult-to-use remote access causes lost productivity when traveling. These obstacles must all be overcome in order to provide productive, usable access to applications.

### Addressing the Challenges with Traditional Products Treating the Symptoms is Not a Cure

When application deployment is complete, it is assumed that the months of planning and trials will yield a successful application rollout. However, often times everything goes according to plan until the application is made available to the entire user community. This can often cause dramatic problems including poor performance reducing overall usability that will affect the entire application and overall success. While many application issues are not easily quantifiable (i.e. poor application performance) there are a number of technologies and products available designed to address individual symptoms. (See Table 1)

SYMPTOM	TREATMENT
Poor Web-application performance	Load balancer
Poor SSL application performance	SSL acceleration
Poor Web application performance	Content caching
Poor server scalability	TCP optimization
Poor performance over WAN	Content compression

**Table 1.** Symptom vs. Treatment

For many application deployments, there is a combination of the symptoms identified above, and many more not described in this document. Addressing each of these symptoms would require a multi-faceted appliance approach. While each

symptom can be treated, the combination of treatments may not provide the best results. In fact, the combination of multiple treatments can cause unwanted and potentially disastrous side-effects.

Consider an enterprise-wide deployment of Oracle financials. While the application is customized to optimize the business processes and increase productivity, application performance issues may hinder user productivity.

Almost instinctively, many performance-related issues seem to be identified as a "network" fault, even if the network infrastructure is performing flawlessly for all other applications. Only after an exhaustive investigation and proof of a network's validity will the problem fall back on the application and its behavior within the infrastructure.

The next approach to solving these problems often consist of adding network-based "treatments" to each of the symptoms. This is a costly exercise which may not solve the overall problem, but temporarily relieves individually identified symptoms.

While incremental performance gains can be realized with each individual treatment, there may be a reduced or negative gain overall when combining all of these treatments in a single application infrastructure. For example, management complexity and support costs are tremendously increased with the addition of each device, because different management interfaces for each appliance require additional administration training, and support contracts must be maintained for each appliance.

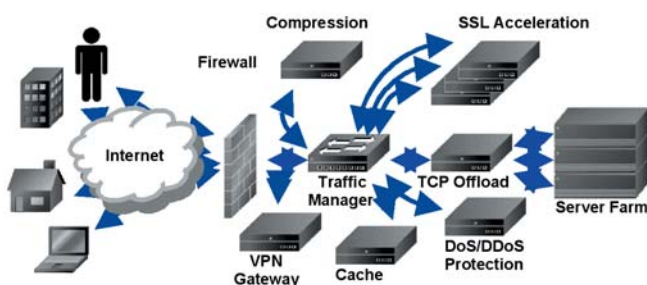


Figure 1. Multi-Product Solution

While the point products deployed in Figure 1 are designed to treat individual symptoms, they do not address the larger issue—how to optimize and accelerate applications while minimizing network complexity and cost. There can be subtle issues in combining these appliances that can affect their effectiveness.

Consider the challenge of using this approach to accelerate secure (SSL) applications:

- **SSL Acceleration Appliance** – Provides high-performance for secure content, increasing application performance.
- **Compression Device** – Provides high-performance content compression, increasing application performance for remote (WAN) users.

Even though individual appliances provide incremental solutions for specific problems, when they are combined they can have an adverse affect on overall application performance if they are not architected in the appropriate order.

## NetScaler Addresses the Complete Challenge

### The Cure for Application Challenges

NetScaler Application Delivery Systems herald a new category of application networking infrastructures, harnessing the combination of performance, security, availability and cost savings needed for enterprises and eBusinesses to confidently deploy critical applications over IP-based networks. The NetScaler systems unify all of the capabilities of conventional load balancers, traffic managers, and remote access systems with advanced application-based functionality.

By combining the features of application delivery and security into a single unified platform, the NetScaler Application Delivery System is able to deliver the incremental benefits of each technology, unlike the point solution approach discussed in the "Addressing the Challenges with Traditional Products" chapter—which shows that, unless properly architected, point solutions can render some technologies useless. (See Figure 2)

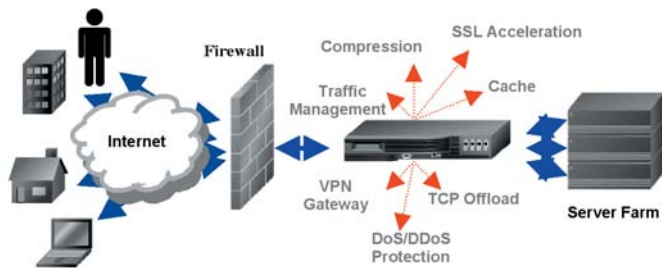


Figure 2. NetScaler Application Delivery System

The NetScaler Application Delivery solution focuses on three fundamental technology areas, all fueled by the NetScaler Request Switching™ engine which allows complex Layer 7 technologies to be implemented with extreme performance. These technology areas include:

- **Optimization** – Ensuring optimal application performance and scalability.
- **Security** – Ensuring application content is secure both from network "eavesdropping" and protected from Denial of Service (DoS)/Distributed DoS (DDoS) attacks.
- **Switching** – Providing incremental application performance as well as application high-availability.

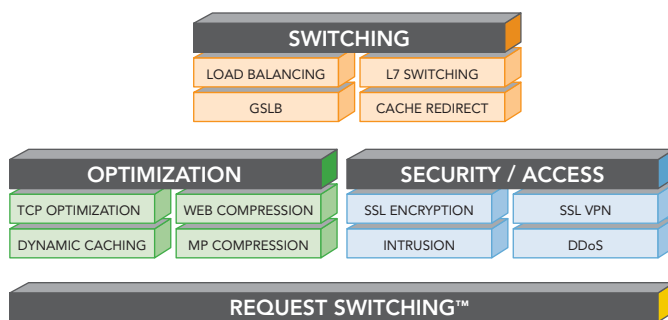


Figure 3. NetScaler technology areas and discrete features

## Optimization

### Dramatic Performance Gains with Minimal Effort

All too often problems with application performance are deemed to be a function of server hardware after network infrastructure has been ruled out. Although the server has a direct impact on server performance (processing power, etc.),

it is not necessarily directly related to application performance. There needs to be a distinction between processing and application performance. Simply increasing processing power in a server may have little or no affect on application performance and scalability. The same may be said for adding incremental load-balanced servers to cope with increased load. Application performance and scalability are typically not issues of exceeding a servers processing power; instead, it can often be a server reaching and exceeding its maximum resource allocation (including network services). Application-specific optimization features can often offload tedious processes from application servers, freeing them to perform their main functions of serving content. This process offload allows servers to scale beyond their original capacity guidelines, increasing capacity while accelerating content delivery.

NetScaler Application Delivery Systems implement a range of application optimization features designed to tune application communications and processes, yielding dramatically improved application performance while increasing server capacity. These results are achieved through NetScaler's innovative technologies without requiring any modifications to either the server or client systems. NetScaler Application Delivery optimization features include:

- **TCP Optimization** – Reduces the amount of client connections each application server has to deal with, while optimizing server responses. The result is a server that can support a larger number of concurrent users, extending the life of existing hardware investment while delivering application content with much better performance.
- **Web Compression (AppCompress™)** – Increases application payload per-packet for Web-based applications. This reduces bandwidth consumption for application access, yielding a reduction in WAN usage and costs, as well as providing increased application performance.

- **MP Compression (AppCompressXP™)** – Uses the same technique as AppCompress, providing support for all TCP-based applications. This unique technology increases performance for non-Web applications (traditional client/server applications) with remote user communities.
- **Content Caching (Dynamic and Static)** – Provides on-board in-memory application content. This feature allows common content (static or dynamic) to be served from the NetScaler system, dramatically reducing resource and latency requirements for application content re-creation. The result is a dramatic improvement in application performance.

It is important to note that each of the optimization technologies provide individual benefits, or are combined to deliver incremental benefits, and require no server or client intervention. The ability to apply all of these optimization technologies to secured (SSL encrypted) content is unique to the NetScaler solution.

## Security

### Protecting From Within

When considering security, it is almost a reflex to think about firewalls and perimeter defense systems, as these are most often the most vulnerable points of an entire infrastructure. All of us can identify with the potential disaster associated with successful attacks on corporate IT assets, so it is logical to think about stopping attacks from "getting in" by securing the perimeter. While many products offer robust security options for the perimeter, the data center and application infrastructure is all too often overlooked. While it is true that a secure perimeter will stop most threats, what happens if an attack is launched from within the "trusted" network? In this case, perimeter defenses are of little or no value. The key components of internal defense are the ability to identify and reject attacks before they reach the application resources (servers). Although many solutions exist to provide some

server protection (Anti-virus and Operating System hot-fixes), it is critical to identify and stop attacks that are launched within the network before they reach the applications.

NetScaler Application Delivery Systems provide comprehensive attack protection from Denial of Service (DoS) attacks, Distributed DoS (DDoS) attacks, network-based worms/viruses and application specific vulnerabilities. At the heart of each NetScaler system is Request Switching, a multi-patented technology that enables a unique, high-performance layer 7 feature set. This technology allows NetScaler Application Delivery Systems to inspect application requests and identify malicious content, stopping it before it reaches the application server(s). The NetScaler Application Delivery security features include:

- **DDoS Protection** – identifies and protects application infrastructures from DoS/DDoS attacks. NetScaler's unique AppDefend™ technology employs multiple layers of protection to protect against a multitude of malicious attacks. This protection goes beyond the traditional SYN cookie technologies employed by other vendors (See the NetScaler SYN protection white paper for more details).
- **Intrusion Filtering** – Protects application servers from malicious worms and viruses by identifying and denying them before they reach the application servers. The unique packet inspection and filtering capability (including inspection of encrypted traffic) within the NetScaler system allows administrators to define policies to protect from these types of attacks. Some common attacks that NetScaler can protect against include Nimda and Code Red.
- **SSL Encryption** – Allows application content to be encrypted on the fly, maximizing application throughput by offloading the server from complex encryption tasks. This ability allows administrators to secure sensitive application content from potential eavesdropping and information misuse.

- **SSL VPN** – Provides a comprehensive secure remote access technology for remote users without the use of additional remote client software, but instead uses common client technology and industry-standard SSL for content privacy. NetScaler SSL VPN technology allows end-users to remotely access any application, remotely including non-Web client/server applications.

## Switching

### More Than Just a Balancing Act

To ensure application availability, NetScaler Application Delivery Systems provide complete application switching functions to allow the distribution of traffic among multiple application servers and/or data centers. This traffic distribution provides higher throughput for client requests and ensures fault-tolerance in the face of server or application outages.

The problem imposed by many of today's switching (load-balancing) solutions is that they are developed to inspect and switch traffic at Layer 4 (connection layer), and have limited application content knowledge or capabilities. The issue with this approach is that it is impossible to force users to request the same amount of application data per connection. In reality, some clients will be more demanding than others, resulting in uneven traffic distribution among servers, which minimizes the distribution benefits gained by load-balancing.

In contrast, NetScaler's switching technology is based on Request Switching, which provides a way to identify and act on discrete application requests per user. By switching at the request level instead of at the connection level, NetScaler is able to offer the industry's leading solution for application traffic distribution with the highest performance. NetScaler switching features include:

- **Load Balancing** – Provides application content distribution among multiple application servers, ensuring increased application performance with fail-over support for business continuity. Request Switching ensures even traffic distribution irrespective of individual user demands.

- **Layer 7 Switching** – Provides content-based traffic distribution. This allows administrators to deploy application specific resources (i.e. image servers, XML servers, HTML servers) tuned to individual content.
- **Global Server Load Balancing (GSLB)** – Provides geographic and network proximity-based content distribution, ensuring remote users are transparently switched to localized content for their specific region, or proximity switched to a local resource for optimal performance.
- **Cache Redirection** – Provides integration with existing cache infrastructures by forwarding application content to preconfigured caches.

## Summary

It is essential that applications and infrastructures be considered together as a common "application infrastructure" that supports strategic business objectives. By dividing the ecosystem between applications and infrastructures and managing them independently, it becomes almost impossible to meet the overall needs that satisfy business objectives. All too often application and network infrastructure groups blame each other for performance problems—application administrators identifying the network as the problem, and network administrators identifying the application as the problem. The real problem is the behavioral characteristics of both the network and applications when they are combined, so both groups need to work together to identify the source of problems and look to a unified solution for resolution.

NetScaler Application Delivery Systems are designed to provide this resolution, ensuring application success with existing network infrastructures with minimal disruption. The unique features of NetScaler Application Delivery Systems are designed to optimize application communications and resources, secure data center assets, and ensure continued application availability. By deploying NetScaler Application Delivery Systems within an enterprise or eBusiness

infrastructure, an organization can realize immediate benefits. The following figure identifies three distinct areas of focus for network and application administrators that affect the application infrastructure ecosystem.

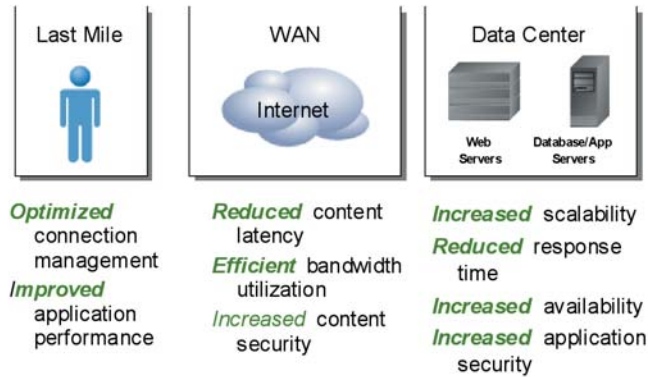


Figure 4. The NetScaler End-to-End Application Solution

The NetScaler 9000 Series is the industry's first solution that bridges the gap between network infrastructures and applications, optimizing application communications while increasing overall performance. The combination of NetScaler's innovative features working in unison at wire-speed in a single platform provide dramatic reductions in operational costs and network complexity. □

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