

## Maximize E-Learning Value and Optimize Application Delivery for WebCT Deployments with Citrix NetScaler Solutions

---

## Table of Contents

- 2 **Increasing the Performance of WebCT Deployments**
- 2 **Overview**
- 3 **The Challenges of Delivering E-Learning Applications**
- 4 **Legacy Network Infrastructure Slows Application Delivery**
- 4 **Accelerating Application Performance with the Citrix NetScaler Application Delivery System**
- 4 **How the Citrix NetScaler Application Delivery System Improves WebCT Performance**
- 5 **Enhancing Application Availability with the Citrix NetScaler Application Delivery System**
- 6 **Summary**

## Increasing the Performance of WebCT Deployments

Challenges faced in deploying e-learning solutions:

- Network inefficiencies and slow client connections can degrade performance for WebCT users
- Application data must be protected without burdening application servers with compute-intensive encryption/decryption operations
- High traffic loads must be intelligently distributed among multiple WebCT servers to ensure a scalable environment

The Citrix® NetScaler® solution:

- Accelerates end-user performance and improves application response by compressing WebCT data, optimizing connections, and caching frequently requested application data
- Secures application delivery with high-performance SSL offload capabilities and superior denial of service attack protection techniques
- Delivers rich server load-balancing capabilities and sophisticated layer 7 content switching functionality to ensure application availability and scalability

*“With the addition of [Citrix] NetScaler [Application Delivery Systems] to our WebCT deployment infrastructure, we experienced a 60- to 80-percent improvement in response time. We also noticed a dramatic improvement in efficiency — the increase in available bandwidth enabled us to support 3,000 additional clients.”*

**— A leading international university using WebCT Campus Edition**

## Overview

Thousands of colleges and universities in more than 70 countries worldwide are expanding the boundaries of teaching and learning with WebCT, the world’s leading provider of e-learning systems. As the demand for technology-enhanced learning continues to grow, educational institutions must meet increasingly high standards for system performance, reliability and the overall quality of the online learning experience.

Educational settings, however, present specific challenges to application providers in that these networks must support many different client types and connection speeds, as well as unpredictable and irregular usage demands. Yet the growing reliance on online education means that e-learning systems must deliver consistent, reliable performance even when deployed on overburdened or inefficient networks.

The Citrix NetScaler Application Delivery System accelerates, optimizes and secures all applications, including e-learning applications such as WebCT’s Campus Edition and Vista systems. Citrix NetScaler solutions are deployed transparently in front of existing servers without requiring costly changes to existing network infrastructure, servers or applications.

---

As a result, Citrix has become the worldwide leader in application networking solutions that optimize the performance, security and availability of both Web and non-Web applications. It is no surprise that the top five sites on the Internet all rely on the Citrix NetScaler Application Delivery System to manage and accelerate hundreds of millions of transactions each day.

This paper details how the Citrix NetScaler Application Delivery System improves delivery of WebCT e-learning applications.

## The Challenges of Delivering E-Learning Applications

As more students and faculty depend on e-learning as part of their academic experience, it is critical to ensure that the online environment performs consistently well and is always available — 24 hours a day, seven days a week. Educational institutions rely on WebCT technology to accommodate heavy traffic, ensure data security, optimize system performance and facilitate rapid growth of their e-learning deployments.

And just as high performance and availability are critical to customer satisfaction for global enterprises, so too are these qualities necessary to ensure the ongoing satisfaction of teachers, students and administrators in settings that depend on e-learning technologies. Educational institutions face challenges similar to those faced by corporations in ensuring the successful deployment and ongoing use of critical applications.

Some of the most salient of these objectives are:

### **Maximize performance for slow client connections**

E-learning is most critical and can reap the greatest benefits in regions where the student population is less concentrated. But these locales are typified by less-advanced communications infrastructures and therefore a higher proportion of end users connect using dial-up, which makes it difficult for e-learning applications to deliver data at satisfactory speeds.

### **Ensure security without loss of performance**

In order to protect sensitive data while in transit, WebCT solutions can use industry-standard SSL encryption. While effectively securing the data, strong encryption is computationally expensive and may slow data delivery and impair server efficiency.

### **Deliver reliable performance and availability for all application transactions**

WebCT Campus Edition and WebCT Vista offer a wide range of functionality to educational institutions. Some operations, however, such as the generation of data that is highly dynamic or user-specific, consume more time and resources.

### **Effectively maintain performance during periods of high server and network utilization**

E-learning applications can place heavy demands on servers and networks for short periods, such as when many users establish connections almost simultaneously or when large files are transmitted to large numbers of users. It is critical for the application to be able to effectively handle spikes in usage in order to maintain a high level of user satisfaction.

### **Utilize resources efficiently and cost effectively**

Providing e-learning can be a competitive advantage for educational institutions, but the application must meet performance and availability goals while minimizing costs. WebCT is often deployed in clusters for this reason.

## Legacy Network Infrastructure Slows Application Delivery

The primary task of delivering applications quickly and securely falls to the network infrastructure. Unfortunately, many networking solutions, like traditional layer 4 load balancers, were never designed to efficiently deliver today's highly transactional and distributed e-learning applications such as those provided by WebCT. Over the years, numerous vendors have announced point products to solve parts of this problem (caching, compression, SSL offload, security, etc). Trying to route all application traffic through multiple network devices from different vendors, however, typically makes application delivery even less efficient.

## Accelerating Application Performance with the Citrix NetScaler Application Delivery System

The traditional method by which corporate network administrators try to improve application performance is to simply throw more server processing power and network bandwidth at the problem. This approach is very expensive and does not address the fundamental challenges inherent with network and data generation delays. The Citrix NetScaler Application Delivery System is purpose-built to ensure optimized application delivery and accelerate WebCT e-Learning applications by offloading server activities that are not critical to the applications themselves. In addition, Citrix NetScaler solutions eliminate the need for multiple inefficient point products and reduce WAN bandwidth requirements. The result is a cost-effective solution that can scale with increasing demand on application availability with the guaranteed best performance for all applications.

## How the Citrix NetScaler Application Delivery System Improves WebCT Performance

For almost any enterprise-class application, the biggest obstacles to achieving high performance have little to do with the application itself. Most often, the culprits are poorly performing networks (particularly on low-speed dial-up, satellite, and wireless access links) and limited server capacity.

The Citrix NetScaler Application Delivery System can improve the performance and availability of both WebCT Campus Edition and WebCT Vista deployments.

---

Following are specific Citrix NetScaler application acceleration features:

**Web Compression** improves performance by reducing the amount of data sent from Web servers to browsers. Citrix® AppCompress™ technology enables the Citrix NetScaler Application Delivery System to compress application responses sent to clients in order to reduce the latency experienced by the application user, while remaining completely transparent to clients. HTTP compression with AppCompress typically yields performance improvements of 4x and higher.

**High-Performance SSL Encryption Offload** protects the privacy of WebCT data without requiring WebCT application servers to perform bulk data encryption operations or expensive SSL session establishment tasks. The Citrix NetScaler Application Delivery System supports up to 750 Mbps of SSL traffic and more than 8700 new SSL sessions each second.

**Multi-protocol Compression** extends performance gains to include all application protocols used in the transportation of application data, including non-HTTP protocols used by WebCT for features such as Chat, Whiteboard and “Who’s Online?” Multi-protocol compression is delivered by Citrix’s AppCompress MP™ technology, which is optionally available on Citrix NetScaler Application Delivery Systems.

**Application Data Caching (static and dynamic)** improves performance by storing frequently accessed data in memory and serving it to multiple WebCT users. Caching dramatically reduces the need to regenerate application data for repetitive requests, thereby reducing the load on the entire back-end application infrastructure. Application data caching is delivered by Citrix® AppCache™ technology, which is optionally available on the Citrix NetScaler Application Delivery System.

**TCP Optimizations** improve the delivery of application content to WebCT users, particularly those with low-speed Internet connections. Optimizations which improve data transmission include:

- TCP KeepAlive maintains persistent TCP connections with clients to reduce expensive, repetitive TCP connection setup and teardown operations.
- TCP FastRamp ensures that connections between users and WebCT servers can carry as much application data as fast as possible, rather than waiting for the reliability of the underlying connection to be proven.

**Surge Protection** maintains server availability even in the face of sudden surges in transaction volume. With Citrix’s Surge Protection technology, WebCT application servers are protected from unexpected spikes in user traffic.

## Enhancing Application Availability with the Citrix NetScaler Application Delivery System

The Citrix NetScaler Application Delivery System also ensures that enterprise applications are highly available and can be scaled to meet increasing demands, while minimizing costs. Integrated capabilities include automatic fail-over to disaster recovery sites and the ability to meet unexpected increases in user demand without expensive, and potentially disruptive, server upgrades.

**Application-layer Switching** and load-balancing improve application availability by directing service requests to the WebCT servers that are best able to provide fast service. If a server fails, its workload is re-routed to other available servers.

**Global Server Load-Balancing** routes transactions to servers across multiple geographic locations, such as dispersed data centers and disaster recovery sites. In the event of a disaster, the workload can be dynamically shifted to a remote data center or disaster recovery site.

## Summary

E-learning has rapidly advanced from the realm of experimenters and early adopters to a mission-critical component of an institution's educational environment. WebCT is a trusted industry leader in providing e-learning systems for educational institutions in more than 70 countries. The Citrix NetScaler Application Delivery System accelerates end-user performance, strengthens application infrastructure security and reduces the cost of implementing e-learning systems by transparently increasing the capacity, performance and security of existing application infrastructures. The combination of the Citrix NetScaler Application Delivery System and WebCT e-learning applications provides educational organizations with the technology foundation on which world-class e-learning environments can be built.

The unique and comprehensive integration of acceleration technologies enables the Citrix NetScaler Application Delivery System to deliver performance gains beyond those provided by point solutions. For example, simple SSL accelerators do nothing more than provide a crude encryption engine, while the Citrix NetScaler Application Delivery System provides sophisticated systems that utilize a variety of technologies to ensure the best application performance possible. The Citrix NetScaler Application Delivery System cover all the bases, not only by offloading SSL encryption from the application server, but also by compressing application data, optimizing TCP connection processing, caching both static and dynamic data and protecting against surges in traffic — all with the end result of freeing up CPU cycles for maximum efficiency. The true value of this solution is more than just the sum of its individual technologies — the entire application delivery process is efficiently orchestrated and optimized.

Bottom line: The Citrix NetScaler Application Delivery System can take a satisfactory WebCT e-learning deployment and make it fly!

## Citrix Worldwide

### WORLDWIDE HEADQUARTERS

#### **Citrix Systems, Inc.**

851 West Cypress Creek Road  
Fort Lauderdale, FL 33309 USA  
Tel: +1 (800) 393 1888  
Tel: +1 (954) 267 3000

### EUROPEAN HEADQUARTERS

#### **Citrix Systems International GmbH**

Rheinweg 9  
8200 Schaffhausen  
Switzerland  
Tel: +41 (52) 635 7700

### ASIA PACIFIC HEADQUARTERS

#### **Citrix Systems Asia Pacific Pty Ltd.**

Level 3, 1 Julius Avenue  
Riverside Corporate Park  
North Ryde NSW 2113  
Sydney, Australia  
Tel: +61 (0) 2 8 870 0800

### CITRIX ONLINE DIVISION

5385 Hollister Avenue  
Santa Barbara, CA 93111  
Tel: +1 (805) 690 6400

[www.citrix.com](http://www.citrix.com)

### NOTICE

The information in this publication is subject to change without notice. THIS PUBLICATION IS PROVIDED "AS IS" WITHOUT WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT. CITRIX SYSTEMS, INC. ("CITRIX"), SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS OR OMISSIONS CONTAINED HEREIN, NOR FOR DIRECT, INCIDENTAL, CONSEQUENTIAL OR ANY OTHER DAMAGES RESULTING FROM THE FURNISHING, PERFORMANCE, OR USE OF THIS PUBLICATION, EVEN IF CITRIX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES IN ADVANCE. THE USE CASES IN THIS PAPER ARE PROVIDED ONLY AS POTENTIAL EXAMPLES AND YOUR ACTUAL COSTS AND RESULTS MAY VARY.



Best Access Experience. Anytime. Anywhere.

**About Citrix:** Citrix Systems, Inc. (Nasdaq:CTXS) is the global leader and most trusted name in on-demand access. More than 160,000 organizations around the world use the Citrix Access Platform to provide the best possible access experience to any application for any user. Citrix customers include 100% of the *Fortune* 100 companies and 98% of the *Fortune* Global 500, as well as hundreds of thousands of small businesses and individuals. Citrix has approximately 6,200 channel and alliance partners in more than 100 countries. Citrix annual revenues in 2005 were \$909 million. Learn more at [www.citrix.com](http://www.citrix.com).

©2006 Citrix Systems, Inc. All rights reserved. Citrix®, NetScaler®, AppCompress™ and AppCache™ are trademarks of Citrix Systems, Inc. and/or one or more of its subsidiaries, and may be registered in the U.S. Patent and Trademark Office and in other countries. All other trademarks and registered trademarks are property of their respective owners.