Accelerate and Protect your E-learning Initiatives using Akamai’s Cloud Based Intelligent Platform™
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>THE AKAMAI ADVANTAGE</td>
<td>1</td>
</tr>
<tr>
<td>ABOUT E-LEARNING</td>
<td>1</td>
</tr>
<tr>
<td>CONFRONTING THE CHALLENGES OF E-LEARNING</td>
<td>2</td>
</tr>
<tr>
<td>WEB APPLICATION DELIVERY</td>
<td>2</td>
</tr>
<tr>
<td>MOBILE</td>
<td>2</td>
</tr>
<tr>
<td>STREAMING VIDEO</td>
<td>2</td>
</tr>
<tr>
<td>WEB APPLICATION SECURITY</td>
<td>2</td>
</tr>
<tr>
<td>THE AKAMAI SOLUTION</td>
<td>2</td>
</tr>
<tr>
<td>TERRA ENTERPRISE SOLUTIONS</td>
<td>3</td>
</tr>
<tr>
<td>AQUA WEB SOLUTIONS</td>
<td>3</td>
</tr>
<tr>
<td>SOLA MEDIA SOLUTIONS</td>
<td>5</td>
</tr>
<tr>
<td>KONA SECURITY SOLUTIONS</td>
<td>5</td>
</tr>
<tr>
<td>CASE STUDY: BETTER SERVICE TO A COMMUNITY OF LEARNERS</td>
<td>6</td>
</tr>
<tr>
<td>CASE STUDY: RAPID, RELIABLE DELIVERY OF ONLINE TRAINING</td>
<td>6</td>
</tr>
<tr>
<td>WHY AKAMAI?</td>
<td>6</td>
</tr>
</tbody>
</table>
Executive Summary

As the workforce becomes more geographically dispersed, governments, businesses, and educational institutions are challenged to educate personnel scalably, cost-effectively, and efficiently. They are rolling out e-learning solutions that range in complexity from a simple website to a fully virtualized classroom. Whether these systems are referred to as computer-based training (CBT), distance learning (DL), or learning management systems (LMS), almost all use web-based technologies to achieve their goals.

Built on the world's largest globally distributed content and application delivery platform, Akamai services are a key component in supporting e-learning initiatives. The Akamai platform enables a secure, high-performing, reliable, and scalable solution unachievable through e-learning software alone.

The Akamai Advantage

The Akamai Cloud is the world's largest, globally distributed content and application delivery platform – a network of more than 105,000 servers in over 83 countries. Akamai servers are co-located in the largest Internet service providers (ISP), enabling Akamai to be close to end users. At its core, the Akamai platform relies on applied mathematics and algorithms to address Internet congestion and availability issues.

If you use the Internet for anything – to download music or software, check the headlines, or book a flight – you probably benefit from Akamai services. Akamai plays a critical role in delivering content to consumers. The Akamai Cloud is a digital operating environment for the web that helps the Internet withstand the crush of requests for rich, dynamic, interactive content, transactions, and applications. Akamai detects and avoids Internet problem areas and vulnerabilities. It allows websites to perform optimally, media and software to download flawlessly, and applications to perform reliably.

Hundreds of enterprises worldwide use the Akamai platform to sell, inform, entertain, advertise, deliver software, and conduct mission-critical business operations. With Akamai's managed services, there is no additional infrastructure to build or deploy, and Akamai can integrate new customers in just a few days.

About E-Learning

Simply defined, e-learning is educational content delivered via technology to users outside of the traditional classroom environment. It has evolved from courseware on CD-ROMs to fully virtualized classrooms that leverage multiple technologies in a distributed environment. Students anywhere can participate in real-time classes through mobile devices or at the desktop while communicating with classmates via instant messaging and chat rooms. Entire curricula can be delivered electronically and tests graded instantly using LMS software. Similar technologies can be used in self-paced study where students around the globe interact with the instructor, watch videos on demand and communicate with classmates via discussion boards and wikis. Organizations typically customize e-learning solutions to meet student needs, the nature of the content being delivered, and the technology available.

An LMS is the key component for delivering educational content online, tracking student progress and providing visibility into all aspects of a training program. All major LMS solutions consume content generated in a sharable content object reference model (SCORM) format. This Department of Defense-developed model is part of an advanced distributed learning initiative launched in 1997 to standardize training management and delivery. One of the greatest benefits of SCORM is that it supports the creation of content that can be used in multiple systems.

Confronting the Challenges of eLearning

Because an LMS uses so many different technologies, it is subject to the issues that affect them. An unrewarding user experience frustrates both students and instructors and an LMS that was purchased to streamline educational efforts can undermine them.
Web Application Delivery

As organizations move educational solutions to the web, performance expectations increase. An LMS typically delivers content in a rich, interactive format which must be dynamically generated at each request. When an LMS is slow or unreliable, users disengage or simply avoid using it. To meet expectations, an LMS must deliver superior performance to all users regardless of their location. It must seamlessly handle traffic during peak usage and be available 24/7. An LMS must also provide intelligence on usage to allow administrators to make informed courseware decisions.

Mobile

The widespread adoption of mobile technologies has spurred demand for educational content on smart phones, tablets, and laptops. Manufactured by multiple providers, these devices have different specifications and usually run proprietary software. Adding to the complexity, end users expect desktop-level performance. Organizations struggle to meet these expectations, often hampered by cellular network bandwidth limitations and the need to support desktop users as well.

Streaming Video

Whether on-demand or live, streaming video is an important feature of all major LMS solutions. Organizations across a range of industries use streaming to integrate prerecorded video into instructional content or to deliver real-time lectures and presentations. A common concern in providing this functionality is scalability. Bursts of traffic from a global user community, or “flash crowds”, are common with live video. Organizations find themselves purchasing infrastructure that can support high levels of demand that will generally be unused.

Streaming video is one of the most powerful features of an LMS, but it consumes large amounts of bandwidth and storage. Infrastructure must be able to deliver uninterrupted video streams to multiple end users simultaneously, often resulting in a tradeoff between video quality and number of connections supported to maintain a consistent level of service. For organizations with large video libraries, the need for reliable storage brings concerns of space, redundancy, and the number of requests for content.

Web Application Security

Utilizing multiple technologies also introduces potential security issues. Motivated hackers can bring web applications down if a site is not properly protected. Their methods include distributed denial-of-service (DDoS) attacks, SQL injection, and cross-site scripting. These attacks can result in unauthorized use of course content (including video), compromised end users systems, or the release of personally identifiable information.

The Akamai Solution

Implementing the Akamai Suite addresses common e-learning issues to improve performance, availability, and scalability. The suite includes:

- **Web Performance Solutions** – to manage traffic to mobile devices and deliver highly dynamic web applications
- **Media Delivery Solutions** – to provide HD-quality streaming video
- **Cloud Security Solutions** – to protect against the increasing threat of web-based attacks

Web Performance Solutions

Akamai’s **Web Application Accelerator** is a managed service that addresses core Internet usability issues. It accelerates dynamic, highly interactive e-learning applications and courseware securely, offering improved performance, high availability, and an enhanced worldwide user experience. It ensures consistent application performance and delivers
Accelerate and Protect Your E-learning Initiatives With Akamai’s Cloud-Based Intelligent Platform

capacity on demand without requiring that IT infrastructure be over provisioned to handle peak periods. Akamai’s Terra Enterprise Solutions also provide visibility into web application performance and insight into end user behavior and usage patterns. These capabilities make it possible to exploit an LMS solution’s power and to create effective courseware.

A key feature of the Akamai Intelligent Platform is content caching. As end users request content, the platform’s dynamic mapping system routes requests to the closest available Akamai Edge server. As content is pulled from the Origin server, Akamai caches it on the Edge server. With more requests, more content is cached, and fewer calls go to the Origin server. Content providers control cache rules and time to live on all content. They can even flush the downstream cache when sudden changes must be made.

Because SCORM courseware standards are based on XML and often refer to static web objects, Akamai can easily cache this data on Akamai Edge servers. To retrieve dynamic/interactive content, Akamai identifies the fastest, most reliable path to the data center via route optimization. Akamai uses several connection techniques to optimize communication between Edge servers and the origin infrastructure, with the aim of delivering dynamic content and avoiding Internet problem areas. Robust access control protects courseware and application content, ensuring security. A dedicated, highly secure portion of the Akamai Intelligent platform delivers Information protected by the SSL protocol.

Ion Mobile offers mobile LMS and courseware users a vastly improved experience whether they are browsing the mobile web or using native applications with “live” Internet data. Utilizing the Akamai Intelligent Platform, this solution provides capabilities that are uniquely suited to both Wi-Fi and cellular connections.

The Akamai Mobile Protocol improves mobile experience quality based on the network’s mobile devices use and the data they typically consume. Because mobile devices operate over cellular carrier and “fixed line” networks (when using Wi-Fi connections), they ultimately rely on data transmitted over the common Internet. The Akamai Mobile Protocol uses real-time connection sensing to apply optimization techniques in both use cases to overcome the high latency and packet loss associated with cellular networks. These optimizations can help improve the performance of mobile LMS and mobile applications using network connections. The result is shorter time to receive data and fewer dropped data connections, leading to an improved user experience.
Ion Mobile is highly scalable and well suited to deploying both desktop and mobile LMS solutions on the Akamai Intelligent Platform. Incoming HTTP requests are evaluated at the Akamai Edge where the server quickly differentiates desktop from mobile browser requests. Redirection responses can then be issued from an Akamai Edge server to the appropriate mobile site for smartphones, feature phones, tablets, and other portable devices, dramatically improving response time. Aqua Ion Mobile relieves IT of the need to implement large and costly databases that identify thousands of device types and provides the programming logic to automatically detect and redirect users to the appropriate website or application.

In addition to mobile acceleration, Ion Mobile offers a fully automated situational performance solution through Akamai Front-End Optimization (FEO). Akamai FEO adaptively applies optimization techniques to each end user based on sophisticated analysis of the web application as well as real-time conditions specific to the end-user's environment—including browsers, devices, network speed, and use of third-party services. Akamai customers can quickly and easily enjoy all the benefits of FEO best practices without needing to become FEO experts or make changes to their Akamaized sites.

An Array of Optimizations

Akamai constantly refines and expands the optimizations available to deliver the following benefits:

- **Reduction of HTTP requests** through techniques such as request consolidation and local browser caching to minimize the overhead associated with each request
- **Reduction of required bytes delivered** by adaptively compressing images and minimizing code without impacting site functionality or visual quality
- **Accelerated page rendering** by delaying non-essential tasks that might block a page load. (These techniques are critical, for example, to prevent slow third-party code from spoiling the user experience.)

As components of the Akamai Intelligent Platform, application code optimizations work with Akamai's other performance, security, and availability offerings. Aqua Ion Mobile brings together dynamic acceleration that delivers every byte faster with optimizations that prioritize and reduce the number of bytes requested and the number of requests needed to deliver those bytes. Together, dynamic acceleration and optimizations offer an exceptionally rich and responsive user experience across devices and networks.
Media Delivery Solutions

Deploying an effective e-learning solution often requires delivering content in a number of formats, from static text and images to live and on-demand streaming video. Most major learning management systems or courseware providers realize this and have incorporated streaming video capabilities into their platforms. As people increasingly watch video on the Internet, they have come to expect a high quality, television-like experience. Taking into consideration heightened user expectations, adding video elements can become an expensive and time-consuming project. It is still important to have video as a part of the learning process because LMS solutions are meant to supplement or sometimes replace classroom study.

HD-Quality Video

When it comes to delivering HD-quality video over the Internet, no platform is larger or faster than the Akamai HD Network. This advanced network combines the power of Akamai’s adaptive bitrate streaming capabilities for Adobe® Flash®, Microsoft® Silverlight®, and Apple® iPhone®/iPad® with the performance and reach of the Akamai HD Edge Platform. The Akamai HD Network leverages Akamai’s HD Edge Platform, so courseware and content is delivered by servers closer to the consumer. Content flows over a single proprietary Akamai network that delivers HD video to the most popular runtime environments, including Flash, Silverlight, and iOS. As a result, content producers can guarantee a great user experience, by delivering uninterrupted HD video playback with the fastest throughput rate available.

Cost-Effective, Cloud-based Storage

Storing and maintaining a large library of courseware assets, such as images, documents, media files, and static SCORM content, can be technically challenging and prohibitively expensive. It requires a significant investment in racks of redundant servers as well as constant maintenance and administration. Akamai NetStorage is a cloud-based, secure storage service that reduces costs and addresses storage issues. It offers terabytes of storage capacity, geographical replication, and a massively scalable architecture as well as proprietary mapping and routing technology. Akamai NetStorage makes it possible to make fault-tolerant storage, rich courseware, and media content available on demand, anytime and anywhere.

Cloud Security Solutions

Kona Site Defender is Akamai’s solution for defending an LMS and its courseware from DDoS, web application-level attacks and direct-to-origin attacks. In addition, the Akamai eDNS solution is designed to protect against DNS infrastructure attacks.

Kona Site Defender mitigates DDoS attacks by absorbing malicious traffic targeted at the application layer, deflecting all DDoS traffic, such as SYN Floods or UDP Floods, targeted at the network layer and authenticating valid traffic at the network edge. Its built-in protection is “always on,” and only Port 80 (HTTP) and Port 443 (HTTPS) traffic is allowed.

Highly Scalable Protection

Kona Site Defender incorporates a full-featured Web Application Firewall (WAF) based on proprietary technology that is designed to provide a highly scalable layer of protection against application and network layer attacks. Implemented across Akamai’s globally distributed platform of tens of thousands of servers, the WAF helps detect and deflect threats in HTTP and HTTPS traffic, issuing alerts or blocking attack traffic before it reaches the website origin.

Application Layer Controls include predefined yet configurable web application firewall rules for different types of attack categories. These rules also enable deep packet inspection of an HTTPS Request/Response and its payload to identify and protect against SQL Injections, Cross-Site Scripting, and other types of attacks.

Network Layer Controls enforce customer-defined IP whitelists and blacklists. List updates are quickly propagated across the Akamai global network, enabling rapid response to attacks. Other features include the ability to halt requests from specific IP addresses to protect the customer origin from application-layer attacks and to implement geographically based blocking.
Accelerate and Protect Your E-learning Initiatives With Akamai’s Cloud-Based Intelligent Platform

Cloaking Website Origins
Kona Site Defender can also cloak (hide) a website origin from the public Internet. This feature adds an additional layer of security without hampering quick and reliable delivery of content, regardless of an end user’s location. It is designed to complement existing LMS and courseware infrastructure and prevent direct-to-origin attacks.

Case Studies

Better Service to a Community of Learners
Built on the Saba LMS, the goal of the Army Learning Management System (ALMS) is to provide access to web-based training anytime, anywhere — reducing the cost of training and increasing morale as soldiers train at their home bases among friends and family. With 175 million hits and 16 TB of traffic during a single month, the ALMS makes significant infrastructure demands. Leveraging the Akamai Intelligent Platform for delivery and site protection enabled an 82% reduction in traffic to the ALMS infrastructure and a dramatic performance improvement for the ALMS user community.

Rapid, Reliable Delivery of Online Training
The Meridian Knowledge Solution delivered by Akamai makes it possible for the U.S. Air Force to deliver online training content rapidly and reliably through its Advanced Distributed Learning Service (ADLS). The ADLS supports the Air Force’s mission by emphasizing the use of appropriate distance learning method and technologies to deliver instructionally sound learning. With support from Akamai, the ADLS achieved performance gains of 6X, while offloading 11 TB of traffic from the origin infrastructure.

Why Akamai?
Thousands of organizations depend on the proven technologies of the Akamai Intelligent Platform to deliver multiple LMS brands and courseware. A number of them have achieved performance gains of up to 6X increases in speed, while being able to offload as much as 80% of the traffic from their infrastructures. Corporations, government agencies, and military organizations running Blackboard, Saba, or Meridian have all reported similar successes in working with Akamai.

The Akamai Intelligent Platform is a worldwide network of more than 100,000 secure servers in 83 countries. In addition to e-learning applications, Akamai delivers between 15 to 30% of all Internet traffic worldwide and tens of billions of online interactions daily. Akamai technologies and services can extend e-learning solutions globally, instantly bypassing traditional server and bandwidth limitations and handling peak traffic conditions and video content with ease.

Akamai FASTER FORWARD

As the global leader in Content Delivery Network (CDN) services, Akamai makes the Internet fast, reliable and secure for its customers. The company’s advanced web performance, mobile performance, cloud security and media delivery solutions are revolutionizing how businesses optimize consumer, enterprise and entertainment experiences for any device, anywhere. To learn how Akamai solutions and its team of Internet experts are helping businesses move faster forward, please visit www.akamai.com or blogs.akamai.com, and follow @Akamai on Twitter.

Akamai is headquartered in Cambridge, Massachusetts in the United States with operations in more than 40 offices around the world. Our services and renowned customer care enable businesses to provide an unparalleled Internet experience for their customers worldwide. Addresses, phone numbers and contact information for all locations are listed on www.akamai.com/locations.

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