

Cisco Global Learning Network

E-Learning technology partnership combines advanced Sun servers and the Cable & Wireless worldwide network with Cisco's Global Learning Network and delivery architecture

Cisco's focus on end-to-end network solutions is nowhere better exemplified than in its work to build a sophisticated e-Learning solution, the Cisco Global Learning Network (GLN). The GLN is a unique network architecture based on Cisco's Architecture for Voice, Video and Integrated Data (AVVID). It includes an end-to-end content delivery system, authoring and virtual learning environment all rolled into one. At every layer it incorporates advanced thinking in e-Learning and content delivery, a combination of e-Learning best practices that schools and other organizations can evaluate as they use the power of the Internet for learning, training, communications, and assessments.

The concept originated within the Cisco Networking Academy™ Program, which needed a system to deliver its online curriculum and assessment to hundreds of thousands of students without diminishing the users' e-Learning experience. A partnership to make the GLN a reality was later forged between Cisco, the non-profit Cisco Learning Institute (CLI), Sun Microsystems and the former Digital Island, now part of Cable & Wireless Internet Services. Sun provided the high-performance Sun server infrastructure and Cable & Wireless offered the globally distributed communications network to maximize the experience of users worldwide.

"Partnering with Sun and Cable & Wireless allowed us to rapidly grow in less than five years from 64 Networking Academies in the U.S. to over 10,000 Academies in nearly 150 countries;"

John Morgridge, Cisco Chairman



The GLN became the distribution system of the Networking Academy program in the summer of 2001.

Background

E-Learning has come a long way since the mid 1970s, when the experience of learning on a computer was more of an “E-Reading” experience. Today, the Internet and private networks link learners and instructors across campuses and around the world. But despite collaborative components built into courses—like chat sessions with fellow learners and instructors—most e-Learning is primarily static instead of truly dynamic and interactive. Learners read text-based content, view supporting visuals or multimedia content, and take text-based examinations. Papers and other projects are sent to the instructor for grading. Comments and mentoring are delivered via email. Tests may be taken online, but the test questions are generally just transferred to the screen.

The Cisco GLN goes well beyond past solutions. It delivers benefits and services that make the e-Learning experience more effective, including an integrated, scalable, and flexible network architecture and a personalized approach with personal feedback, dynamic assessments, and access to content on-demand that will allow the learner to view topics based on learning style preferences.

Challenge

The Cisco Networking Academy Program has been called the world’s largest e-learning laboratory. This worldwide effort designed to teach Internet technology skills to youth and adults administers more than 35,000 online exams a day over the Internet. Through the Networking Academy program, high schools, community colleges, technical colleges, four-year colleges, universities, and other educational programs receive instructor training and Web-based curriculum modules. From the very start, the Networking Academy program ran on Sun enterprise servers. For the program’s migration to the GLN in 2001, a newer, more robust and scalable server architecture was designed to support thousands of concurrent users, a rich media curriculum, dynamically-created Web pages and assessments, and diverse caching schemes.

“The GLN had to be highly scalable, and we didn’t want to saddle institutions with extensive integration tasks to implement it,” says George Ward, Cisco Senior Manager, e-Learning Systems. “We had developed rich media and interactive components in a clearly defined authoring environment using Web-based open



Cisco GLN goes well beyond past solutions.

standards and a distributed architecture with sophisticated caching to avoid latency. The servers where the content, applications, and services resided had to be bulletproof and highly reliable, something Sun has always been known for.”

Solution

The GLN integrates the main elements of an e-Learning solution—content, applications, services, and network infrastructure—into a single architecture. The new GLN architecture for the Networking Academy program was installed at the San Jose, California, data center of the program’s service provider, Cable & Wireless Internet Services in mid-2001.

The core elements of the GLN form a global content delivery network system: A Sun Enterprise 4500 server and a hot standby backup, a Cisco Content Distribution Manager (CDM) with course content and the Academy Connection, a portal that helps control and direct the distribution of media-rich curriculum and assessments, and edge Content Engines (CEs) for delivery. The Academy Connection was migrated from the old architecture to the GLN. All course content for the Networking Academy program was rewritten to take advantage of the Cisco Learning Institute’s CLI Virtuoso™, a unique authoring and content delivery system for e-learning that stores and delivers curriculum content and assessment questions and results for each student according to his or her mastery of the subject matter. Eight other Sun 420 servers perform as Web servers and application servers.

Another feature, the GLN Services Manager, assists individual Networking Academies by analyzing network topology and performance at the local area network (LAN) level to ensure the efficient operation of the GLN. There are different hardware, network, and caching options that are available and the GLN Services Manager helps determine which is most cost-effective and practical based on the location, size, and resources of each institution.

“The global reach of Cable & Wireless and their ability to fine-tune their network for our needs made the e-Learning experience the same high quality worldwide, whether an Academy is in Africa, Asia, or the U.S.”

Kevin Warner, Senior Director of Worldwide Education for Cisco Systems

In the Cable & Wireless San Jose data center, an application “cradle” was built that contains redundant connections, network devices, and Sun servers with no single point of failure. Most technology solutions that are being deployed within the Networking Academy program reside in this “cradle” to take advantage of the redundancy built into the system. There is a T3 connection through a Cisco 7200 Series router. After passing through the Cisco PIX Firewall, a Cisco LocalDirector load-balances server requests across the Sun server farm, which is interconnected by multiple Cisco Catalyst 6509 Series switches. In the event of a failure at any point on the network, backups are in place to immediately take over with minimal or no interruption in service. The LAN components within the Cable & Wireless data center also have full redundancy, protecting the network against WAN outages and the failure of a LAN device.

Results

The GLN was designed to serve small schools in remote areas to large ones in major cities around the world. Networking Academies may choose from different content caching options to reduce costs and enhance network performance.

A Cisco CDM coordinates the activities of all the Cisco CEs in the network and acts as an origin server for the content it is distributing. The CDM also monitors CE connectivity to ensure that all Academy CEs are online and able to receive content at their scheduled times. Each CDM has a monitoring Web site that shows all the CEs associated with it and their online status.

“The architecture maximizes network uptime, while minimizing the potential for network failures,” says Vince Enriquez, GLN Operations Manager at Cisco. “This is critical when, at any time, there are students somewhere in the world who are taking online assessments.”

The evolution of the GLN for the Cisco Networking Academy Program continues. Each month, new institutions see the clear resource and enhanced educational benefits in the new infrastructure.

"Sun Microsystems is proud of its long association with the Networking Academy program, the world's leading IT skills e-Learning infrastructure," says Kim Jones, Vice President of Worldwide Education and Research Computing for Sun Microsystems. "The scalability, reliability and availability of the Sun infrastructure have allowed the Academy program to grow at an unparalleled pace, and to deliver the Fundamentals of UNIX and Fundamentals of Java Programming courses, which Sun sponsored to thousands of students and future developers worldwide."

Next Steps

Coming to the GLN is an optional feature called “More Info” that will allow students to drill down in specific content areas for additional study and that will include rich media presentations as well as simulations and broadcast-quality streaming video content. This feature will address the issue of different learning style preferences and will allow content that is typically bandwidth-heavy to be delivered over the Internet to the learner without network delays using Cisco’s Content Distribution Networking architecture.

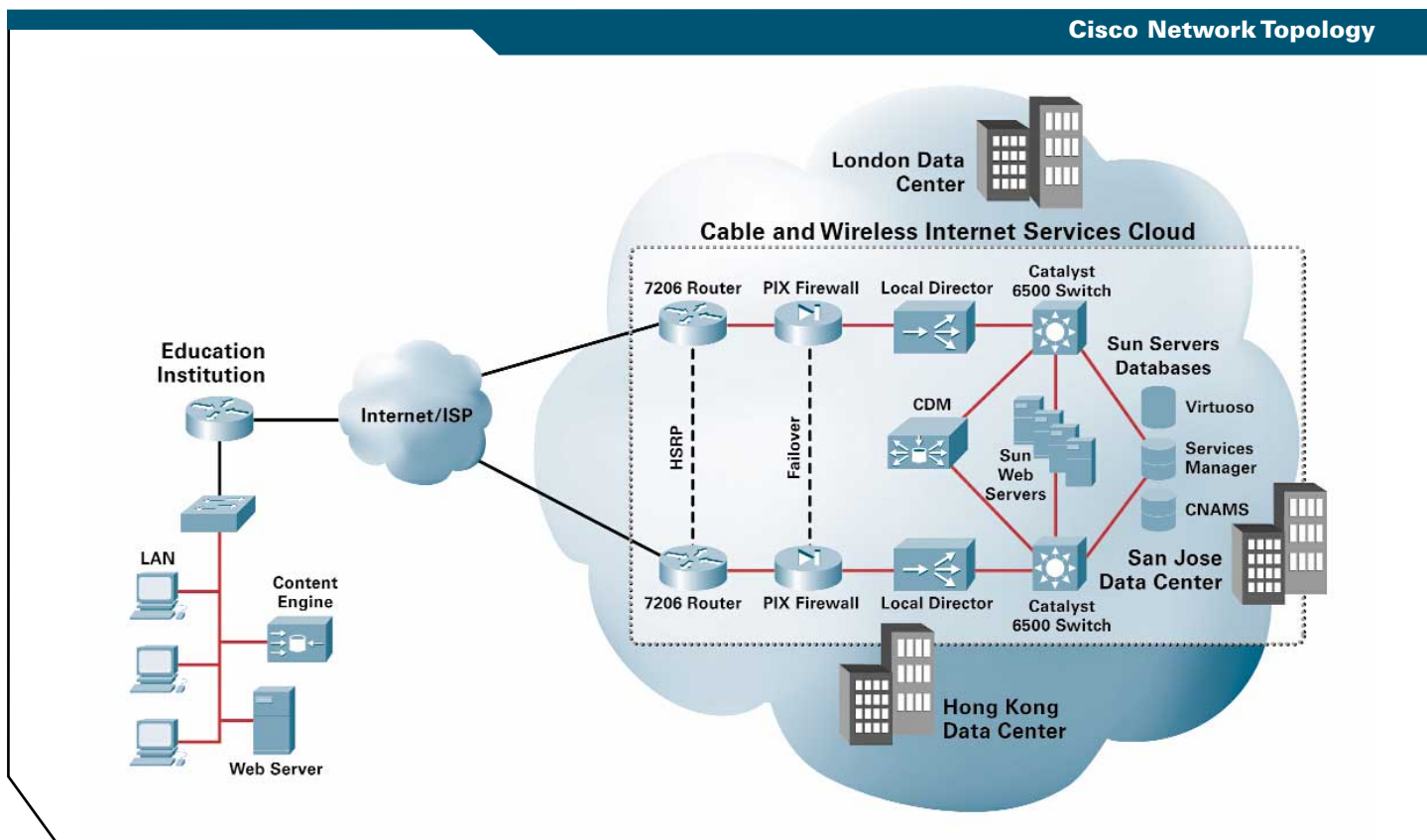
Another feature, the GLN Virtual Classroom, will provide students and teachers with an interactive, collaborative environment for scheduling, phone conferences, live interactive audio or video broadcasts of class lectures along with archived video on-demand of the same lecture, online chat, white board data, follow-me browsing, application sharing, and other activities. This will be accomplished by integration of Cisco IP telephony, IP video and collaboration capabilities into a Virtual Classroom portal that will utilize the GLN Services Manager application to scale these technologies across the Internet using Sun servers and Sun Java 2 Enterprise Edition (J2EE) open standards.

Increased access to more effective learning is the ultimate goal of the GLN. Beginning as a vehicle for technical education, it has proven for the Cisco Networking Academy Program to be a model for transforming course design and delivery both in the industrialized world and in least developed regions.

Further Reading

Cisco Networking Academy Program and GLN Snapshot

- The GLN infrastructure includes a Sun server infrastructure with Sun Enterprise 4500 Servers and 420 servers.
- As of September 2002, there are more than 10,000 Networking Academies in 148 countries
(For more information about the Cisco Networking Academy Program visit: www.cisco.com/edu/academy)
- For more information about Cisco's Content Delivery Network System and Content Engine products visit: www.cisco.com/univercd/cc/td/doc/product/webscale/index.htm
- For more information about Cisco's Architecture for Voice, Video and Integrated Data (AVVID) visit: http://www.cisco.com/warp/public/779/largeent/avvid/cisco_avvid.html



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